Claims

1. A method for controlling a source of liquid metal ions, the source comprises a tip a first electrode and a second electrode, the method comprising the steps of:

maintaining the first electrode at a first voltage level range and maintaining the second voltage at a second voltage range, such as to extract metal ions formed on a tip of the source, during an active mode of operation of the source; and

maintaining the first electrode at a third voltage level range and maintaining the second voltage at a fourth voltage level range, such as to substantially reduce an extraction of metal ions from the tip, during an idle mode of operation of the source;

whereas at least one out of the third and fourth voltage level ranges does not include zero voltage level; and

whereas the first voltage level range differs than the third voltage level range.

2. The method of claim 1 whereas the first electrode is an extraction electrode.

3. The method of claim 1 wherein an upper end of the first voltage level range is higher than an upper end of the third voltage level range.

4. The method of claim 1 wherein the third voltage level range comprises voltage levels that are lower than a non-extraction voltage level by a first voltage difference.

5. The method of claim 1 wherein an upper end of the fourth voltage level range is higher than an upper end of the second voltage level range.

6. The method of claim 1 wherein a transition between the idle mode and the active mode does not substantially alter ion-optical properties of an ion-optic components positioned downstream of the source.

7. The method of claim 1 wherein a transition between the idle mode and the active mode is fast.

8. The method of claim 7 wherein a transition between the idle mode and the active mode does not substantially alter ion-optical properties of an ion-optic components positioned downstream of the source.

9. The method of claim 7 wherein the transition is faster than a minute.

10. The method of claim 1 wherein a transition between the active mode and the idle mode is fast.

11. The method of claim 1 whereas the first electrode is a suppression electrode.

12. The method of claim 1 wherein during the idle mode there is no emission of ions from the tip.

13. The method of claim 1 wherein during idle mode ions being provided to the tip are maintained in a liquid form.

14. The method of claim 1 wherein a transition between the idle mode and the active mode is followed by step of stabilizing ion extraction from the tip.

15. The method of claim 13 wherein the stabilization step comprises measuring a flow of extracted ions from the tip and altering a voltage level of a voltage being supplied to one or more electrode.

16. The method of claim 1 wherein a transition between idle mode and active mode does not involve heating the source.

17. A source of liquid metal ions, comprising:

a tip;

a first electrode and a second electrode;

a controller, coupled at least one voltage supply, for maintaining the first electrode at a first voltage level range and maintaining the second voltage at a second voltage range, such as to extract metal ions formed on a tip of the source, during an active mode of operation of the source; and for maintaining the first electrode at a third voltage level range and maintaining the second voltage at a fourth voltage level range, such as to substantially reduce an extraction of metal ions from the tip, during an idle mode of operation of the source;

whereas at least one out of the third and fourth voltage level ranges does not include zero voltage level; and

whereas the first voltage level range differs than the third voltage level range.

18. The source of claim 18 whereas the first electrode is an extraction electrode.

19. The source of claim 18 wherein an upper end of the first voltage level range is higher than an upper end of the third voltage level range.

20. The source of claim 18 wherein the third voltage level range comprises voltage levels that are lower than a non-extraction voltage level by a first voltage difference.

21. The source of claim 18 wherein an upper end of the fourth voltage level range is higher than an upper end of the second voltage level range.

22. The source of claim 18 wherein a transition between the idle mode and the active mode does not substantially alter ion-optical properties of an ion-optic components positioned downstream of the source.

23. The source of claim 18 wherein a transition between the idle mode and the active mode is fast.

24. The source of claim 24 wherein a transition between the idle mode and the active mode does not substantially alter ion-optical properties of an ion-optic components positioned downstream of the source.

25. The source of claim 24 wherein the transition is faster than a minute.

26. The source of claim 18 wherein a transition between the active mode and the idle mode is fast.

27. The source of claim 18 whereas the first electrode is a suppression electrode.

28. The source of claim 18 wherein during the idle mode there is no emission of ions from the tip.

29. The source of claim 18 wherein during idle mode ions being provided to the tip are maintained in a liquid form.

30. The source of claim 18 wherein the controller is capable of initiating a stabilization process after a transition between the idle mode and the active mode.

31. The source of claim 31 wherein the stabilization process comprises measuring a flow of extracted ions from the tip and altering a voltage level of a voltage being supplied to one or more electrode.

32. The source of claim 31 wherein a transition between idle mode and active mode does not involve heating the source.